REMARKS/ARGUMENTS

Upon entry of this Supplemental Reply, claims 19-45 will remain pending. Claims 19 and 29 are independent claims.

Reconsideration and allowance of the application are respectfully requested.

Response To Maintaining Of Restriction Requirement

Applicants once again note that the requirement previously confirmed that rejoinder of the non-elected process claims is possible upon allowance of product claims, and if the process claims contain all the limitations or are dependent on the product claims. Therefore, Applicants respectfully request that the Examiner review the process claims, and rejoin them upon allowance of the elected product claims. Moreover, for the reasons set forth below, Applicants respectfully submit that their invention is patentable over the prior art of record, whereby allowance of all of the pending claim is warranted, and respectfully requested.

Response To Rejections Based Upon Prior Art

The following rejections are set forth in the Office Action:

(a) Claims 19-23, 25-28, 42 and 43 are rejected under 35 U.S.C. 102(b) as being anticipated by, or in the alternative, under 35 U.S.C. 103(a) as obvious over WO 96/30207 to Ravagni et al.

(b) Claim 24 is rejected under 35 U.S.C. under 35 U.S.C. 103(a) as being unpatentable over WO 96/30207 to Ravagni et al. in view of Partlow et al., U.S. Patent No. 5,683,528.

Initially, Applicants once again note that U.S. Patent No. 6,576,182 is a family member of WO 96/30207, and is in the English language. Accordingly, in discussing WO 96/30207, reference will specifically be made to its family member U.S. patent, and these family member documents will collectively be referred to as "the Ravagni documents".

Moreover, Applicants note that arguments for patentability of Applicants' disclosed and claimed invention are set forth in their previous responses. For the sake of brevity, Applicants are not repeating each of these arguments herein, but include Applicants' previous arguments herein as if set forth in their entirety herein.

The Examiner is reminded that Applicants' invention, as recited in independent claim 19, is directed to a ceramic multi-layer filter comprising:

at least two layers, said at least two layers comprising the same or different ceramic materials, and a different particle size of ceramic particles in said at least two layers;

one of said at least two layers is a support layer and at least one other layer of said at least two layers is present as a layer with ceramic material with a smaller particle size;

particle surfaces of all ceramic particles in each of said at least two layers, during formation of said at least two layers, are wet entirely or partially with at least one material which wets the surfaces of the ceramic particles and has the same or approximately the same thermal coefficient of expansion as the ceramic particles, and the particle size, particle morphology and particle composition/crystal structure of the ceramic particles is not altered or only slightly altered with about $\leq 1\%$ shrinkage of the ceramic multi-layer filter, and in which at least one of spot and surface connections are formed between the particles; and

pore volume and pore size between the ceramic particles is reduced by the material only slightly or only partially but not by more than 50%.

As Applicants have previously argued, according to the present invention the recited structure includes the feature that the particle size, particle morphology and particle composition/crystal structure of the ceramic particles is not altered or only slightly altered with about $\leq 1\%$ shrinkage of the ceramic multi-layer filter, and in which at least one of spot and surface connections are formed between the particles; and pore volume and pore size between the ceramic particles is reduced by the material only slightly or only partially but not by more than 50%. In contrast, in the Ravaging documents a considerable change of the particle size and/or particle morphology and/or particle composition and/or crystal structure occurs, and the amount of pores and the pore size of the shrinkage-matched component in the Ravagni documents are thus also changed considerably. This change is expected in the Ravagni documents by one skilled in the art, because the particles change their form and size through the participation of the ceramic component in the sintering.

This does not occur in the present invention because no sinter bridges are formed between the ceramic particles during sintering and so no change in the ceramic particles takes place. The bond between the ceramic particles substantially occurs through the bonds formed through the liquid phase of the wetting material. This is a difference in structure and must be addressed in the rejection.

Still further, Applicants' claims include that the particle surfaces of all ceramic particles in each of said at least two layers, during formation of said at least two layers, are wet entirely or partially with at least one material which wets the surfaces of the ceramic particles and has the

same or approximately the same thermal coefficient of expansion as the ceramic particles. Thus, the at least one material wets the surface of the ceramic particles, and has the same or approximately the same thermal coefficient of expansion as the ceramic particles. Moreover, the at least one material does not alter or only slightly alters the particle size, particle morphology and particle composition/crystal structure of the ceramic particles with about $\leq$ 1% shrinkage of the ceramic multi-layer filter, and in which at least one of spot and surface connections are formed between the particles. The Ravagni documents do not disclose such a material and do not teach or suggest a ceramic multi-layer filter having a structure as recited in Applicants' claims.

Regarding the assertion in the rejection that Ravagni discloses "particles wet by wetting material (glass, for example – see specification)", Applicants again note that the rejection does not point to any disclosure of Ravagni to support this assertion. While Ravagni discloses further components including glass, there apparently is no disclosure of glass as a wetting material. The specific characteristic of the powders i-iv in the first layer of the Ravagni documents is that they are made of ceramic and either differ in grain size or have a sinter-inhibiting effect. Because of this, particles are present in the sintered material either loosely or are fused together, but without being wetted by a second phase. This is unlike the present invention, and cannot yield structure as recited in Applicants' claims. Thus, Applicants respectfully request that the rejection specifically indicate how the structure recited in Applicants' claims is taught or suggested in the Ravagni documents when it would be readily apparent to one having ordinary skill in the art that the structures are different.

Expanding on the above and to further emphasize the differences between Applicants' claimed invention and the subject matter disclosed by the Ravagni documents, Applicants submit the following information regarding the Ravagni documents and the presently claimed invention.

Product Disclosed In Ravagni Documents

composite including

at least two components (A+B)
- at least one ceramic component (**A**) which is **adjusted to shrinkage behaviour of B** (column 2, beginning at line 15)
- component(s): ceramic or non-ceramic (**B**) with a given shrinkage behaviour

component A: is produced

- **by sintering** of **ceramic** powders (column 2, beginning at line 29)

(sintering means per definition: temperature treatment below melting point, typically 0.7 of melting point)

- **by using one of three types of powders** (column 2, beginning at line 37)

a) powder (i) $\leq$ 500 nm
b) powder (i) + powder (ii) $\leq$ (i), with sinter-inhibiting properties
c) powder (i) + powder (iii) $\geq$ (i) and $\leq$ 500 µm

Sintering which is a temperature treatment below melting point means **in all three cases a/b/c** that powder particles are **sintered together without any melting phase** between particles.

The sintered product (ceramic component A) of the composite contains bonded ceramic particles, fully or partially sintered together but **without any secondary phases between** the **ceramic** particles – no other materials than ceramics, such as **no metals, no glasses**.

To get a bonding between the particles without a secondary phase means that **powder particles have to alter their shape and/or size (morphology)** to form sintered necks during the temperature treatment. Otherwise the powder will not be bonded together.

In the Ravagni documents, each of the three cases a)-c) a **"nano"sized powder (i) $\leq$ 500 nm must be involved** (column 2, beginning at line 29). Otherwise the process of shrinkage adjustment does not work.

component(s) B: is made of - ceramic or non-ceramic, ceramic, metal, glass (column 3, beginning at line 48), not specially described,
- **special case of B**: - B is made of powder (iv), which is made of agglomerates of powder (i). (column
In such case, B is made only from ceramics, because powder (i) is per definition a ceramic.

In the Present Invention:

composite

Multilayers, at least two layers (A+B)
- **(A)** made of ceramics, built by ceramic particles
- **(B)** also made of ceramics, built by ceramic particles, which are different in size from (A)

In both cases (A+B), the **surface of the particles is wetted by a secondary material** (such as glass).

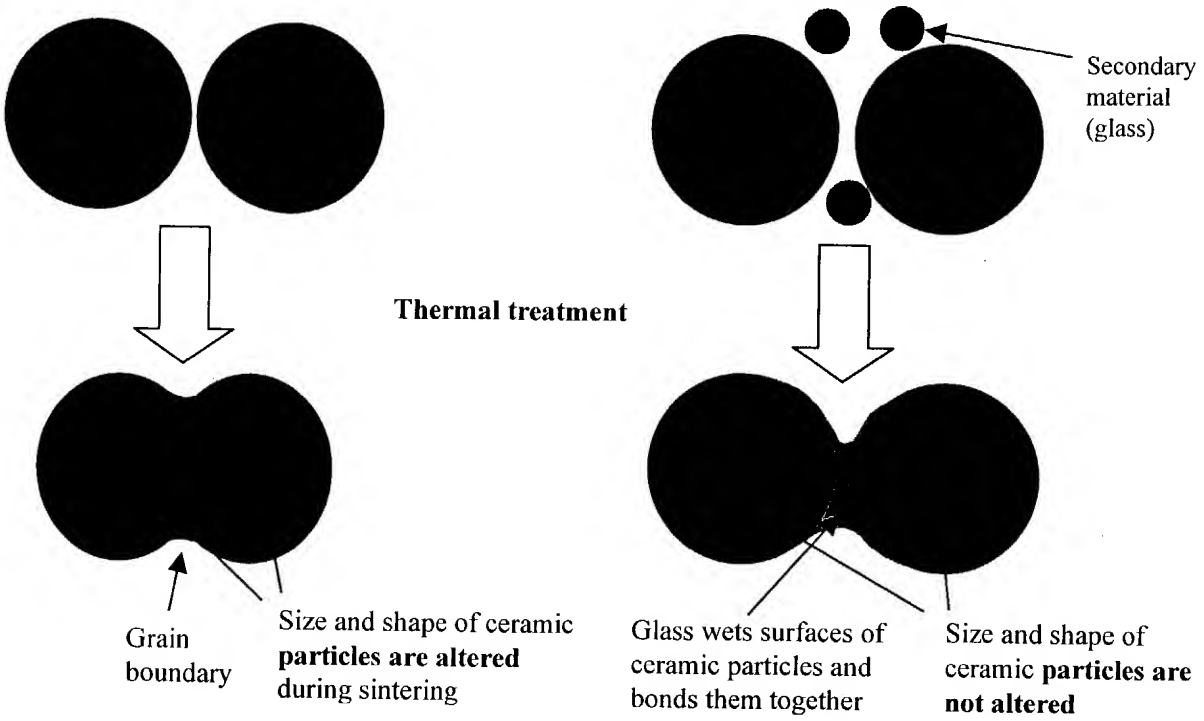
That means:
- (A) is made of ceramic particles, bonded by the secondary material
- (B) is made of ceramic particles (with different size), also bonded by the same secondary material

The **connection** between the particles **in both layers (A+B)** is made by the **secondary material, not by the ceramic.** The ceramic particles (size, morphology, composition) are **not** altered.

This means contrary to the Ravagni documents that no sintering between the ceramic particles takes place, but a melting of the secondary material (Temperature above Tm of the secondary material).

Ravagni Documents
Starting powders and materials structure in **component A** of composite

Instant Application
Starting powders and materials structure in **both** components



Thus, Applicants note that their arguments are not only directed to process conditions, but to differences in structure associated with Applicants' ceramic multi-layer filter, and these structural differences are not taught nor suggested in the prior art of record.

Still further, the Examiner's attention is once again directed to the Examples of Ravagni which include embodiments which show a different structure than that recited by Applicants.

Example 1 of the Ravagni documents is directed to a composite of a dense ZrO_2 layer (sheet B) on a porous ZrO_2 substrate (sheet A). This should not be considered to be a multi-layer filter, because of the dense layer. Moreover, before sintering sheets A and B contain ZrO_2 particles of 10 nm. During sintering at 1150°C for 2h both sheets are subjected to a linear shrinkage of 40% and one of the sheets is densely sintered. Moreover, such high shrinkage should lead to a considerable change of the 10 nm particles and it will be possible to detect changes in form and size of the particles in the structure.

A two-layer structure is described in Examples 3 – 5, the sheets in these examples are sintered together at 1500°C for 2h, and it is disclosed that there is a linear shrinkage of 5% (sheet A) and 4% (sheet B). The differences between 5 and 4% are considerable for sintering a layer composite and would lead to stresses or distortion of the laminate. With a length of foil of 100 mm, this would be a1mm difference in length. It does not appear that a shrinkage of 4-5% is sufficient to achieve dense layers whereby the two layers may be porous. However, at a sinter temperature of 1500°C, at least the fine corundum powder (200 or 400 nm) will be greatly changed in both layers with regard to form and size, since otherwise no sintering of the particles would occur and after sintering the material would disintegrate into its powder components. One skilled in the art

would also expect powders of this fineness to be considerably changed regarding size and grain form during sintering at the given temperatures.

In Example 6, sintering is performed at 1550°C and leads to a shrinkage of 30% and to a dense layer B, so that here an analogous great change of the grain size, the pore size and the pore volume as in Examples 1-2 is to be assumed. Also, a change in crystal structure would be expected under these sintering conditions with the gamma Al_2O_3 being transformed into the alpha phase.

Still further, the Examiner is once again reminded that in order for inherency to be present the Examiner has the burden of showing that the result indicated by the Examiner is the necessary result, and not merely a possible result. In re Oelrich, 212 U.S.P.Q. 323 (CCPA 1981); Ex parte Keith et al., 154 U.S.P.Q. 320 (POBA 1966). The fact that a prior art article may inherently have the characteristics of the claimed product is not sufficient. Ex parte Skinner, 2 U.S.P.Q.2d 1788 (BPAI 1986).

As the Board of Patent Appeals and Interferences states in Ex parte Levy, 17 U.S.P.Q.2d 1461, 1463:

> However, the initial burden of establishing a prima facie basis to deny patentability to a claimed invention rests upon the examiner. In re Piasecki, 745 F.2d 1468, 223 USPQ 785 (Fed. Cir. 1984). In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art. In re King, 801 F.2d 1324, 231 USPQ 136 (Fed. Cir. 1986); W.L. Gore & Associates, Inc. v. Garlock, Inc., 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983); In re Oelrich, 666 F.2d 578, 212 USPQ 323 (CCPA 1981); In re Wilding, 535 F.2d 631, 190 USPQ 59 (CCPA 1976); Hansgirg v. Kemmer, 102 F.2d 212, 40 USPQ 665 (CCPA 1939).in order for inherency to be present it must be a necessary result, and not merely a possible results. Ex parte Keith and Turnquest, 154 U.S.P.Q. 320 (B.O.A. 1966).

In the instant situation, as previously noted by Applicants and as again noted herein, it is seen that the Ravagni documents do not teach the ceramic multi-layer structure recited in Applicants' claims, and the prior art does not teach or suggest any modification of the Ravagni documents to arrive at Applicants' disclosed and claimed invention, and the advantages associated therewith.

Applicants' once again note that Partlow does not overcome the deficiencies of the Ravagni documents. In this regard, Partlow is utilized in the rejection merely for its disclosure of borosilicate glass in ceramic layers. Accordingly, whether or not Partlow would motivate one having ordinary skill in the art to include borosilicate glass in the Ravagni documents, Applicants' disclosed and claimed invention would not be present.

Still further, as previously noted by Applicants, Partlow discloses the production of a special borosilicate glass that is used to produce electronic packages. The term "multi-layer" is here used for the powder, i.e., a method is described of how spherical SiO_2 powder with a surface containing B_2O_3 can be enveloped in a multi-layer manner. This powder is used as an active component for producing foils for electronic packages. In the sintering of the packages at any rate a highly dense product is aimed for; i.e., the borosilicate glass powder is used as active component for dense sintering (column 4, lines 45-47 or claim 1d), primarily because through its fluxing effect it can cause a densification at temperatures below 1000°C. It is sintered alone (in the example) or together with a ceramic filler material, preferably quartz powder. In any case, however, the borosilicate glass powder will form the matrix of the material (claim 1d), i.e., the greatest proportion of the volume, whereas the ceramic powder is added only as a component of smaller amount. The purpose of the filler material here is to match the coefficient of expansion of

the sintered (dense) material to that of the semiconductor materials (e.g. GaAs, column 3, beginning at line 66) mounted on the packages.

Since before sintering the powder has porosity in the green body, but during sintering it is sintered into a dense product, it would appear that during sintering a 100% reduction of the pore volume occurs through the use of the specially produced multi-layer borosilicate glass powder.

Thus, one having ordinary skill in the art would not have been motivated to combine the documents in the manner asserted in the rejection, and even if combined would not arrive at Applicant's disclosed and claimed invention.

Still further, Applicants' dependent claims further patentably define Applicants' inventions. Thus, claim 20 further patentably defines that when more than two layers are present on the support layer, the particle size of the ceramic particles decreases in a direction going away from the support.

Claim 21 further patentably defines that the at least two layers comprise layers of the same ceramic material.

Claim 22 further patentably defines that the ceramic material is silicon carbide or aluminum oxide.

Claim 23 further patentably defines that the ceramic material in all layers of the filter and the material which wets the surfaces of the ceramic particles, have a same composition in all layers of the filter.

Claim 24 further patentably defines that the material that wets the surfaces of the ceramic particles and forms the at least one of spot and surface connection between the ceramic particles is

a borosilicate glass, an aluminum borosilicate glass or a lithium aluminum silicate glass. As discussed above, the Ravagni documents do not teach or suggest such a glass material.

Claim 25 further patentably defines that the quantity of material, which wets the surface of the ceramic particles and forms the at least one spot and surface connection between the ceramic particles, is selected in terms of size in such a way that the pore volume and the pore size between the particles is reduced only slightly by the material.

Claim 26 further patentably defines that the quantity of material, which wets the surface of the ceramic particles and forms the at least one spot and surface connection between the ceramic particles, is selected in terms of size in such a way that the pore volume and the pore size between the particles is reduced by not more than 10%.

Claim 27 further patentably defines that the ceramic particles of at least two layers differentiate from one another in a ratio of 1 : 5 to 1 : 10 in terms of their average particle size.

Claim 28 further patentably defines that the particles of the support layer have an average particle size of 20 to 50 μm.

In view of the above and the arguments previously set forth by Applicants which are incorporated herein, the rejections of record should be withdrawn, and all of the pending claims indicated to be allowable. In the event that the rejection is maintained, the Examiner is respectfully requested to specifically point out structural similarities between Applicants' disclosed and claimed invention with respect to the prior art when the prior art is different from Applicants' invention in the diverse instances noted above.

CONCLUSION

In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejections of record, and allow each of the pending claims.

Applicants therefore respectfully request that an early indication of allowance of the application be indicated by the mailing of the Notices of Allowance and Allowability.

Should the Examiner have any questions regarding this application, the Examiner is invited to contact the undersigned at the below-listed telephone number.

Respectfully submitted,
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